Response to SAIC Review Comments

Work Plan, Human Health Risk Assessment and Transport Evaluation, North Boeing Field, Seattle, Washington (Landau Associates, May 21, 2010)

General Comments

- The human health risk assessment (HHRA) and transport evaluation, as described in this work plan, are two independent evaluations and would be better addressed in two separate work plans. As written, the document not clear about which proposed samples will be used to support each of the two evaluations. We suggest pulling the transport evaluation out of this document and providing a separate work plan.

  Response: Although they are two distinct evaluations, both support the same objective: identifying whether existing PCB concentrations in concrete joint material (CJM) present an unacceptable level of risk directly to onsite receptors or by way of potential transport to Slip 4. Combining the efforts in one report will allow for the preparation of one cohesive document, rather than two or three separate cross-referenced documents.

- The title of this document should be more specific to accurately reflect the objectives: Work Plan, Human Health Risk Assessment for Worker Exposure to PCBs in the Flightline Area. The current title implies that this assessment is an HHRA for the NBF site, which it clearly is not. It does not address risks from chemicals other than PCBs or potential offsite receptors/exposures.

  Response: We will modify the report title to clarify that it is focused on PCBs in CJM at the NBF site.

  We disagree with the statement that the HHRA and transport evaluation are not applicable to the NBF site as a whole, as implied by suggesting that its applicability in the title be limited to the Flightline. As the focus area of these evaluations bounds the highest PCB concentrations in CJM observed during past investigations, it provides a more conservative estimate of site-wide risk than if areas with lesser PCB concentrations were to be included in the overall data set.

  If Ecology would prefer, instead, that Boeing includes data from less-impacted areas (e.g., non-Flightline parking lots and roads west of the Flightline Area and the North Lateral drainage areas after this year's CJM removal activities are complete) in the data set used to calculate the reasonable maximum exposure concentration in order to make it "an HHRA for the NBF site," Boeing would be happy to discuss that possibility. With respect to "chemicals other than PCBs or potential offsite receptors/exposures," Boeing intends for these evaluations to be focused on PCBs in CJM. Based on the reasonably likely transport and exposure scenarios for PCBs in CJM, there is no reason to expand the scope of these evaluations to include more than onsite workers and an assessment of potential transport to Slip 4.

- In general, the HHRA work plan does not provide enough detail about release mechanisms, transport pathways, potential receptors, or exposure pathways. Specific comments are provided below.

  Response: Responses will be provided to more specific comments.

- While wipe samples may be appropriate for assessing human health risks associated with direct contact exposures, they are not appropriate or sufficient for characterizing PCB concentrations in concrete, and additional characterization (bulk concrete samples) may be required to assess the potential for transport to the SD system. Hexane-soaked wipes are recommended by EPA to determine the presence of PCBs beneath leaking PCB-contaminated equipment. However, hexane wipes are limited in four essential characteristics:

  Response: The purpose of collecting surface wipe samples is to assess human health risks associated with direct contact exposures, not to characterize PCB concentrations in concrete. Please note that transport to the storm drain system is being evaluated empirically through the collection of storm drain filter samples. As described in the draft work plan, those samples will provide a direct measurement of "the concentration of PCBs in concrete joint material fragments and other solids [including abraded surface concrete material] *entering the storm drain system at NBF." An empirical demonstration eliminates uncertainties in modeling fate and transport mechanisms from in-place PCB-containing CJM and concrete into the storm drain system. Bulk concrete sample collection would not add any substantive value in meeting the objectives of this evaluation.*

  1) <u>Limitations of Porous Surfaces</u> – Solvent wipes work best on non-porous surfaces (e.g., window frames and metal drums). However, with porous surfaces (e.g., brick and concrete) the PCBs will tend to stay locked in the matrix or may even be driven further into the porous material.

     Response: How solvent wipes "work best" is a function of the sampling objectives. The fact that PCBs in porous surfaces (e.g., concrete) "will tend to stay locked in the matrix" is not a confounding factor for the HHRA because it is simply a reflection of the relative availability of PCBs in concrete for uptake via dermal exposure. In fact, the use of solvent wipes has been found to significantly <u>overestimate</u> the availability of PCBs for normal dermal uptake. Sampling techniques designed to more closely reflect actual dermal exposure have found that using hexane-wetted wipes and the standard rubbing protocol may overestimate concentrations actually available for normal dermal uptake by a factor between 8 and 100[1].

[1] Slayton, T.M., P.A. Valberg, and A.D. Wait. 1998. "Estimating dermal transfer from PCB-contaminated porous surfaces." *Chemosphere*. 36(14): 3003-3014.

2) Limitations of Fuel/Oil Contamination – If the concrete apron surface has any residual fuel or oil contamination, the petroleum will be picked up preferentially by the hexane wipe and will give a PCB concentration that is incorrectly low.

Response: Based on discussions with Analytical Resources, Inc., the normal conditions of paved surfaces at the NBF site do not result in interference with quantification of PCB concentrations on surface wipe samples. In consideration of Ecology's concerns about the potential interference of residual petroleum hydrocarbons on the ability of surface wipe samples to accurately quantify PCB concentrations, areas with obvious signs of petroleum hydrocarbon contamination in the concrete will not be sampled.

3) Variability of Rubbing – In Section 3.1 (Paved Surface Sampling), Landau states that they will "firmly wipe" the surface area to collect the sample. They are correct in that this is the method that the EPA recommends. However, there is an "Alternate Rubbing Method" involving placing a 2-inch by 2-inch stainless steel puck (weighing 4.5 pounds) over the wipe and rubbing in a clockwise motion three times. This additional pressure increases the amount of PCBs picked up by 300% to 400% over the standard wipe protocol.

Response: The objective of wipe sampling to support the HHRA is not to achieve full extraction of all PCBs on concrete surfaces. It is, rather, to provide a conservative estimate of the PCBs on concrete surfaces that are available for normal dermal uptake. As noted in another response above, the proposed solvent wipe sampling approach provides a reasonable maximum exposure estimate that may be 8 to 100 times the actual concentration of PCBs available for normal dermal sorption. Adopting the "Alternate Rubbing Method" would result in estimates that are beyond what would normally be considered a reasonable maximum estimate for risk assessment purposes.

4) Depth of Contamination – Hexane wipes work best when the spill/drip occurs at the surface of the concrete (e.g., the concrete pad beneath a leaking PCB transformer). The wipe will then pick up the maximum amount of contamination. However, for NBF, the PCBs have leached from the runway caulk into the surrounding concrete. Therefore, the maximum amount of PCBs will likely not be at the surface of the concrete.

Response: How solvent wipes "work best" is a function of the sampling objectives. These evaluations are not intended to quantify maximum concentrations of PCBs at depth in any potentially contaminated substrate at the site. These evaluations focus on estimating the risk associated with onsite exposure to PCBs in CJM and impacted concrete and transport of those materials into the storm drain system and potentially into Slip 4. Regardless of where the maximum PCB concentrations in concrete may be, the surface of the concrete is the point of exposure for onsite maintenance workers evaluated in the HHRA. Surface wipes appropriately quantify the PCBs to which those receptors may be exposed.

One option would be to add 10 1-inch diameter concrete core samples (located adjacent to 10% of the 100 surface wipe samples) to provide an analytical correlation to the surface wipe samples. Approximately 5 grams of concrete sample is needed for this analysis.

Response: As described in previous responses, the collection of concrete core samples would not result in substantive benefit to the HHRA and transport evaluation. Boeing is not planning to collect concrete core samples as part of these evaluations.

- Given that PCBs were detected in only 2 of 86 panel interior and 2 of 30 near joint wipe samples at Boeing Everett, and the concerns associated with wipe sampling for porous surfaces (described above), it is not clear that collecting 100 wipe samples at the NBF Flightline will be an efficient use of resources. Wipe samples from concrete surfaces as proposed may not provide useful result for the following reasons:

  Response: Please note that the proposed reporting limit for wipe samples in this investigation is 0.1 micrograms per 100 square centimeters ($\mu g/100\ cm^2$), ten times less than the reporting limit used in the investigation at Boeing Everett. If there are similarities in concentrations at the two sites, the order of magnitude reduction in the reporting limit is expected to result in an increased frequency of detection.

  - Even if PCBs are not detected, results may not provide the answers Boeing is looking for. For example, if no PCB detections are observed in the NBF wipe samples, and using the exposure parameters listed in Table 5 of the work plan and the most recent ProUCL software/guidance, estimated cancer risk from ingestion and dermal contact exposure pathways would be 3.5E-6.[2] So, even if no PCBs are detected, the estimated risk would be above the MTCA acceptable risk level of 1E-6 for an individual substance. (Please note that the HHRA addresses risks associated with PCBs only, and does not include metals or other chemicals to which workers may be exposed.) If PCBs are detected, this estimated cancer risk value will be higher.

    Response: The acceptable cancer risk level for an individual substance at industrial sites is $1x10^{-5}$ [WAC 173-340-745(5)(b)(iii)(B)]. The basis of SAIC's estimated cancer risk from ingestion and dermal contact is unclear. Concentrations at or below the reporting limit are below the acceptable risk level identified in MTCA. Using the exposure parameters listed in Table 5 of the draft work plan and the upper-bound toxicity value for total PCBs (2.0 kg-d/mg), the cumulative risk from dermal exposure and incidental ingestion is $7x10^{-7}$ for a reporting limit of 0.1 $\mu g/cm^2$ in wipe samples.

  - Wipe samples will not adequately characterize the PCB concentrations in concrete adjacent to concrete joints (see issues associated with wipe sampling, above) for purposes of assessing transport to the SD system and Slip 4. Additional CJM

[2] The ProUCL guidance suggests that when most (e.g. >95%) of the observations for a contaminant lie below the detection limit(s) or reporting limits, the sample median or sample mode may be used as an estimate for the exposure point concentration. When the majority of data are nondetects, the median and mode will also be a nondetect. The uncertainty associated with such estimates is high. (From ProUCL Version 4.00.04 User Guide, EPA/600/R-07/038, February 2009).

sampling and concrete core sampling/profiling (by depth and distance from joints) is needed for this purpose.

Response: As noted in an earlier response, transport to the storm drain system is being evaluated empirically through the collection of storm drain filter samples. As described in the draft work plan, those samples will provide a direct measurement of "the concentration of PCBs in concrete joint material fragments and other solids [including abraded surface concrete material] *entering the storm drain system at NBF." Furthermore, core samples characterizing PCB concentrations at depths below the paved surface would not reasonably represent the PCB concentrations present in concrete at the paved surface which is the actual location from which abraded concrete would originate. An empirical demonstration eliminates uncertainties in modeling fate and transport mechanisms from in-place PCB-containing CJM and concrete into the storm drain system.*

- Have any alternatives to wipe sampling been considered? What about a street sweeping study, by area, as recommended in SAIC's Operations & Maintenance Technical Activities Review (May 2010)?

  Response: A street sweeping study was considered as an alternative means of collecting data during the development of this work plan. We believe that surface wipe samples representing existing paved surface conditions present a more representative characterization of PCB concentrations available to exposure by direct contact.

- It is not clear why estimating an average concentration of PCBs in CJM fragments throughout the flightline is the appropriate way to address the issue of fate and transport to Slip 4. (See additional comments on Section 8.0 below.)

  Response: It is our understanding that EPA is selecting a benchmark concentration of PCBs in storm drain solids discharging to Slip 4 that will be considered protective of that waterway. Although we believe the annual mass loading of PCBs to Slip 4 from NBF is probably a more useful measure of impact, we have designed this work plan to yield data consistent with the benchmark that is being developed (i.e., a concentration-based benchmark). Stormwater flows through the lift station prior to discharge to Slip 4. Any entrained storm drain solids that may pass through the lift station to Slip 4 are likely to be a well-mixed composite from all of the NBF drainage areas.

Specific Comments

Section 1.0 (Introduction)

- Page 1-1, 2nd paragraph: The last sentence indicates that "the concentration of PCBs from concrete joint material…will be estimated as part of the fate and transport evaluation…" Why estimate the *concentration* of PCBs in the storm drain system that originates from CJM? Wouldn't it make more sense to estimate the *mass* of PCBs that are being transported to Slip 4?

  Response: As stated in an earlier response, it is our understanding that EPA is developing a benchmark concentration of PCBs in sediments discharging to Slip 4 that will be considered protective of that waterway. Although we believe the annual mass loading of PCBs to Slip 4 from NBF is probably a more useful measure of impact, we have designed this work plan to yield data consistent with the benchmark that is being developed (i.e., a concentration-based benchmark). Storm drain solids that are discharged to Slip 4 pass through the lift station prior to stormwater discharge to Slip 4. Any entrained storm drain solids that may pass through to Slip 4 are likely to be a well-mixed composite from all of the NBF drainage areas.

- Page 1-1, 3rd paragraph: In the third line, "…fate and transport of concrete joint material" should be revised to state "…fate and transport of PCBs in concrete joint material."

  Response: Comment noted and acted upon.

- Page 1-1, 1st bullet: The last sentence indicates that Section 2 will include a separate sub-section to describe the "proposed means of evaluating the fate and transport of PCBs in concrete joint material that may be migrating to Slip 4." I did not see this sub-section in Section 2.

  Response: The sentence in question referred to a working draft of the report and has been deleted.

- Page 1-1, 3rd bullet: The text states that Section 4 will describe "procedures for quantifying the intensity, frequency, and duration of exposure." What is "intensity" of exposure – do you mean the magnitude of exposure?

  Response: "Intensity" is defined as "magnitude of a quantity per unit." In this case the magnitude is normalized to body weight, exposed skin area, etc. The terms intensity and magnitude are often used interchangeably in EPA's risk assessment documents[3] as the magnitude of exposure is inherently understood to be normalized to the receptor's physical characteristics. Although this is standard risk assessment terminology, we will use the word "magnitude" instead of "intensity" to reduce confusion by those unfamiliar with risk characterization.

[3] See, for example, EPA's *Research Programs: Human Health Risk, Risk Assessment Process* website (http://www.epa.gov/NHEERL/research/human_health_risk/risk_process.html), EPA's *Region 2 Risk Assessment Activities* website (http://www.epa.gov/region02/risk_assessment.htm), EPA's *Integrated Risk Information System (IRIS), Site Help & Tools* website (http://www.epa.gov/IRIS/help_ques.htm), etc.

- Page 1-2, 1st bullet: The text states that Section 9.0 will contain a summary of "expected" deliverables. Is there some uncertainty about what deliverables will be prepared and submitted? Suggest deleting the word "expected."

  Response: "Expected" will be changed to "planned."

Section 1.1 (Background)

- Page 1-2, 2nd paragraph: The text does not mention that the City of Seattle analyzed five caulk remnant samples in September 2008, with concentrations ranging from 0.67 to 2,200 mg/kg PCBs.

  Response: The city of Seattle's samples were split samples from locations where samples were collected by Boeing but not analyzed for PCB Aroclors. These sampling locations were from isolated areas where small amounts of CJM were not removed between 2002 and 2006, typically because the CJM was not accessible. The concentrations are consistent with the range of other PCB-containing CJM previously mentioned in Section 1.1. The text will be revised to make clear that some elevated PCBs concentrations in CJM remained in isolated locations where CJM was not removed.

- Page 1-2, 3rd paragraph: The text states that the north lateral SD basin is not included within the focus area for the HHRA. This is not entirely correct, as the northwest corner of the focus area (between Buildings 3-350 and 3-380) is in the north lateral SD basin.

  Response: Thank you for noting that this text is not clear and accurate. The area of note is, indeed, part of the North Lateral drainage area. Due to Flightline activities, PCB-containing CJM will not be removed from that specific area in conjunction with the CJM removal actions scheduled for the general North Lateral drainage area. The text will be modified to clarify that the focus area of this evaluation does not include areas of the North Lateral from which PCB-containing CJM will be completely removed.

- Page 1-2, 3rd paragraph: The last sentence states that "only a few isolated, low-level detections of PCBs have been detected outside of the focus area." This statement is somewhat misleading, in that very few JCM *[sic]* samples have been collected in the north lateral SD basin. Also, how are you defining "low-level"? According to Figure 1, PCB concentrations in the PEL area (outside the HHRA focus area) are as high as 25 mg/kg, and eight samples contained PCBs over 1 mg/kg. Given Ecology's proposed 1 mg/kg remediation level, these concentrations do not appear to meet any definition of "low-level."

  Response: Consistent with previous removal actions, we have considered concentrations below the TSCA level of 50 mg/kg to be "low level" with respect to this work plan. The relative availability of PCB concentration data in CJM in the North Lateral drainage area is not considered relevant to this work plan; with the exception of the above-noted area between Buildings 3-350 and 3-380, all PCB-containing CJM in the North Lateral drainage area is scheduled for removal this summer.

Section 1.2 (Objectives)

- Page 1-3, last paragraph: The text implies that the HHRA and transport evaluation will be used to determine whether any additional remedial actions are required with respect to CJM in the focus area. The evaluation proposed in this work plan is not sufficient to make this determination; additional factors may be considered by Ecology before making a determination that no further action is needed with respect to CJM in this area.

  Response: Boeing recognizes that Ecology and EPA will both take into consideration a number of factors before making a determination that no further action is needed with respect to CJM at the NBF site. These results will, however, provide a basis for those decisions and will be used by Boeing to determine what actions, if any, to propose to the agencies.

Section 2.1 (Model Description)

- Page 2-1: The second paragraph in Section 2.1.1 indicates that "the flight line is swept on a daily basis." This statement is misleading. While sweeping occurs on most days somewhere in the flightline area, any given location within the flightline area is not swept daily. Sweeping is done as staff and schedules permit; during SAIC's review of sweeping logs, numerous gaps in sweeping activities and/or sweeping records were observed.

  Response: It is noted that SAIC's observations of actual sweeping practices were correct and the text in this work plan is being revised accordingly.

- Page 2-2: The first paragraph of Section 2.1.2 should state that mechanical sweeping of the Flightline may also contribute to the release of concrete joint material particles.

  Response: The text is being revised to include this specific example as one of the site maintenance activities that may contribute to the release of CJM particles.

- Page 2-3: The fourth paragraph of Section 2.1.3 describes the receptor population selected for evaluation in the HHRA. Please provide additional information about the selected receptors: what types of activities do these workers engage in? There must be a variety of different groups of workers that are potentially exposed to PCBs: testing engineers, maintenance workers, sweeper truck drivers, etc. Please describe the receptor and the types of activities by which exposure to PCBs originating from CJM might occur. See also comments on Figure 2, Conceptual Site Model.

  Response: The text is being revised to provide greater detail about the maintenance workers who will be evaluated as the receptor population in the HHRA.

Section 2.2 (HHRA Data Set)

- Page 2-3: Because the description of receptors and exposure pathways in Section 2.1.3 is incomplete, there is insufficient rationale for the identification of data needed to quantify these exposures. For example, the second bullet refers to surface area dust from outdoor and

indoor floors and work surfaces. However, it is not clear how these data needs relate to the selected receptors. Additional information is needed here and/or in Section 2.1.3.

Response: The text is being revised to provide greater detail about the maintenance workers who will be evaluated as the receptor population in the HHRA.

Section 3.0 (Sampling and Analysis Plan)

- Page 3-1: This section should clearly differentiate samples that will be collected to support the HHRA from samples that will be collected for the "fate and transport" evaluation.

  Response: The structure of this section is being reorganized to differentiate between samples that will support the HHRA and those that will support the fate and transport evaluation.

Section 3.1 (Paved Surface Sampling)

- Page 3-1: Please provide a discussion of the pros and cons associated with wipe sampling, as opposed to collecting bulk concrete and/or CJM samples. Also, please provide a reference for the sampling methodology described in the last paragraph on this page, and explain why this methodology is appropriate for assessing human health risks.

  Response: Text is being added to this section to make note of why wipe sampling better meets the data needs of this evaluation than bulk concrete and/or CJM samples. Reference information will also be included in the text.

Section 3.2 (Shed Floor Sampling)

- Please explain why only the shed floors are proposed for sampling. Section 2.2 indicates that surface area dust concentrations from indoor floors "and work surfaces" is needed. Why are no other surfaces planned to be sampled?

  Response: Early working drafts of the work plan included a combination of samples from shed floors and work surfaces. However, further consideration of the most significant transport mechanism leading to the deposition of PCB-contaminated CJM fragments in work sheds (i.e., tracking material in via pedestrian traffic's shoes) indicated that focusing on shed floors and not higher work surfaces would yield more conservative results (i.e., estimates of higher exposure levels). Section 2.2 is being modified to remove the reference to sampling of non-floor work surfaces in the sheds.

- Shed floor samples should be collected in the area near the entrance, where presumably more pedestrian traffic takes place. Please discuss the pathway(s) for transport of PCB materials and exposure routes for the sheds.

  Response: The sheds to be sampled are all so small that any floor surface samples will be representative of areas frequented by pedestrian traffic or of areas where the same pedestrian traffic-generated floor debris preferentially collects. Additional text is being

added to describe transport mechanisms and exposure pathways for PCB-contaminated CJM fragments in the sheds.

Section 3.3 (Air Quality Sampling)

- Outdoor air sampling stations OAS-02 and OAS-03 appear to be located right next to each other. One of these should be moved to a different location to provide better coverage of the flightline area.

  Response: All sample locations were identified using a random number generator to select unbiased sample locations within the focus area. We will be happy to identify an alternative location to one of the two locations noted to provide better areal distribution of samples.

- Please state at what height the air quality samples will be collected. Is this breathing zone height or something lower and presumably more conservative?

  Response: The text is being revised to specify that air quality samples will be collected from the breathing zone.

Section 3.4 (Stormwater Solids Sampling)

- This section should clearly state that stormwater solids sampling will be conducted to support the "fate and transport" analysis. (Stormwater solids are not shown on the conceptual site model, which creates some confusion for the reader.)

  Response: The text is being revised to clarify that stormwater solids sampling will be conducted to support the fate and transport evaluation.

- While random selection of SD structures to be sampled is important if a statistical estimate of the "average" concentration will be calculated, it's not a very useful approach for source tracing. (As discussed in the comments on Section 8 below, it is not clear why the approach of calculating an average PCB concentration in each SD line was selected, as opposed to calculating CJM-associated PCB loading.) For source tracing, it would be more useful to install catch basin insert filters in areas where high concentrations of PCBs have been detected in the SD system, to assess whether these are associated with nearby surface sources, nearby subsurface sources, or upstream storm drain sources. Of the 25 solids sampling locations selected, only five have grab sample PCB concentrations above 1 mg/kg DW, and none have concentrations over 5 mg/kg DW (based on the most recent data for each location). Thus, these data will be of limited use for further source tracing efforts to be conducted as part of the RI/FS.

  Response: Source tracing was not one of the objectives of this evaluation, which is why sampling points were selected randomly. However, the most recent sampling data, which has become available after preparation of the draft work plan, will be used to modify the original 25 sampling locations to include the locations where the highest PCB concentrations have been recently detected in the focus area.

- The use of 180 micron catch basin insert filters is proposed. However, the highest PCB concentrations are associated with particles that are <63 microns in size (see SAIC's recent particle size fractionation data), and SAIC's draft Slip 4 Modeling Report estimates that approximately 70 percent of PCBs discharged to Slip 4 are associated with the <63 micron size fraction.

  Response: The proposed catch basin insert filters are a standard size offered by manufacturers. The text in Section 3.4 also states, "Filter fabric of smaller micron filtration size will be used if available." In light of SAIC's particle distribution information, we are actively exploring options for improving the capture of small-diameter particles through the use of alternate catch basin filter inserts.

- The text states that filters will be left in place for one month. However, because sampling will occur during the dry season, it is unlikely that this will be enough time to collect sufficient sample material. This type of approach would be more appropriate during a wet season.

  Response: Filters will be left in place to provide a sampling duration that includes one month of the wet season.

- The text states that the material collected by the filter will be "placed into a 4-oz or 8-oz glass sampling jar." Will the filters be scraped to remove any smaller particles that may be captured in the filter fabric?

  Response: Rather than scraping the material off of the filter, the filter media will be included in the sample that is analyzed. The dry weight of a clean filter will be backed out of the laboratory's calculations for bulk concentration.

<u>Section 3.5 (Concrete Joint Material Sampling)</u>

The purpose for collection of concrete joint material samples is not described in this section. Please provide some discussion/rationale.

Response: As noted above, the structure of Section 3.0 is being reorganized to differentiate between samples that will support the HHRA and those that will support the fate and transport evaluation.

<u>Section 4.0 (Exposure Assessment)</u>

- The second paragraph describes the baseline HHRA process. The proposed HHRA does not constitute a "baseline risk assessment"; instead, it addresses one chemical of potential concern (PCBs) from one type of source (CJM). It is described in Section 7.0 as a "screening level evaluation." It might be better described as a "focused risk assessment."

  Response: Comment noted and acted upon.

- Page 4-2 refers to Section 2.1 for a description of receptors and exposure pathways. However, as discussed in the comments on Section 2.1 above, these descriptions are inadequate.

  Response: As noted above, the descriptions in Section 2.1 are being modified to present more detail.

Section 4.1 (Exposure Point Concentrations)

- The first paragraph indicates that Aroclors that are detected in fewer than 5 percent of samples will not be evaluated as COPCs. However, the slope factor used to estimate cancer risk for PCBs is based on total PCBs. Is Landau proposing to eliminate some Aroclors from the calculation of total PCBs?

  Response: Aroclors will not be eliminated from the calculation of total PCBs. As cancer risk for PCBs is evaluated on a cumulative basis (i.e., for total PCBs), individual Aroclor mixtures will not be removed from the summation of total PCBs. The text will be revised to clarify that individual Aroclor ranges may be eliminated from consideration of only non-cancer risk if they are detected in fewer than 5 percent of samples.

- The text refers several times to "chemical COPC" – please note that this is redundant.

  Response: Comment noted and acted upon.

- The work plan states that if a "chemical COPC" is not detected, then half the value of the reporting limit will be used as a proxy value for the sample's concentration when calculating the UCL95. This is incorrect, and does not reflect current risk assessment practice. The 2009 ProUCL guidance states that use of the DL/2 method "is not recommended due to its poor performance." EPA's National Exposure Research Laboratory (NERL) "strongly recommends avoiding the use of DL/2 method even when the percentage (%) of NDs is as low as 5%-10%. There are other methods available in ProUCL 4.0 that should be used to compute the various summary statistics and upper limits based upon data sets with multiple detection limits."

  Response: Non-detect data will be handled in accordance with current ProUCL methodology depending on the percentage of non-detects in the data set.

Section 4.2 (Chemical Intake Rates)

- If the specific exposure parameters (Table 5) are presented in this work plan, their sources, derivation, and applicability must be discussed. A better approach may be to state that exposure parameters will be selected based on the Exponent HHRA conducted at the Boeing Everett site, and leave a more detailed discussion of each parameter for the HHRA report.

  Response: Exposure parameters will be selected based on the Exponent HHRA conducted at the Boeing Everett site; a more detailed discussion of each parameter will be included in the HHRA report.

Section 5.0 (Toxicity Assessment)

- This section is written generically, as though COPCs have not yet been selected. Given that PCBs are the only COPC being evaluated, please make this section specific to PCBs. List the toxicity values for PCBs that will be used in the HHRA, and either indicate that a toxicity summary for PCBs will be provided as part of the HHRA or else provide it here. Given the focused nature of this HHRA, the generic text is inappropriate.

  Response: Toxicity information will be included in the HHRA report. Specific toxicity values will also be included in the text of the work plan.

Section 7.0 (Uncertainty Evaluation)

- This section is totally generic and not very useful. It would be better to eliminate this section and state that an uncertainty evaluation will be performed as part of the HHRA and will be described in the HHRA report.

  Response: Although an uncertainty evaluation will be included in the final report, it is helpful to have a preliminary discussion that qualitatively assesses whether the planned approach will have a tendency to overestimate or underestimate risk. This section will be left in the report in its current condition.

Section 8.0 (Slip 4 Fate and Transport Evaluation)

- The title of this section does not accurately reflect its content. A more appropriate title would be "Transport of PCBs from CJM to Storm Drain System." The first paragraph states that "very little information has been collected to date to actually evaluate the transport of concrete joint material fragments through the storm drain system." This is a true statement, but it is not clear how the activities described in this section will address this data gap, as the proposed effort does not address what happens to the CJM particles once they enter the SD system.

  Response: This evaluation is not intended to address what happens to CJM particles once they enter the storm drain system. The objective is to determine whether existing PCB concentrations in CJM result in storm drain solids with concentrations that exceed the remediation level for discharge to Slip 4 (e.g., the 0.100 mg/kg DW concentration currently recommended by EPA or the alternate 0.420 mg/kg DW concentration recently proposed by Landau Associates). If PCB concentrations in CJM yield concentrations in stormwater solids that are less than the accepted remediation levels, then that observation may be one element to support a request to leave existing CJM in place at the NBF site.

- The second paragraph states that the purpose of this evaluation is "to determine the average concentration of PCBs in concrete joint material fragments that enter the storm drain system and may be discharged to Slip 4." It is not clear why estimating an average concentration of PCBs in CJM fragments throughout the flightline is the appropriate way to address the issue of fate and transport to Slip 4.

Response: Please refer to the immediately preceding response regarding the objective of this evaluation. Collecting storm water solids concentration data throughout the Flightline keeps the focus on PCBs originating in CJM fragments rather than other sources (e.g., contaminated soil) that may impact the overall concentration of PCBs discharged to Slip 4.

- See comments on Section 3.4 above regarding the proposed use of 180 micron filters.

  Response: See the response to the above-referenced comment.

- This first paragraph of Section 8.2 (Data Evaluation) says that this evaluation will estimate "the potential impacts to Slip 4 based on the average concentrations of PCB-containing concrete joint material fragments in solids discharging to the storm drain system based on data from suspended solids data from sediment trap sampling and filtered solids data collected from the various drainage basins at NBF." It is not clear what this sentence is trying to say; please reword.

  Response: The sentence is being revised for clarity.

- Boeing proposes to convert the SQS value for PCBs to a dry weight concentration based on the average TOC concentration in sediment trap samples. Ecology has not determined whether this is an appropriate comparison; results should also be compared to the LAET/2LAET values.

  Response: We agree with Ecology's concern that appropriate values for comparison have not yet been established. The text is being revised to state more generically that concentrations will be compared to sediment quality standards for Slip 4.

- Has Boeing considered developing estimates of PCB loading to the storm drain system associated with the CJM? This may be a more appropriate way to evaluate the contribution of CJM to the overall mass of PCBs entering Slip 4.

  Response: It is our understanding that EPA is selecting a benchmark concentration of PCBs in sediments discharging to Slip 4 that will be considered protective of that waterway. Although we believe the annual mass loading of PCBs to Slip 4 from NBF is probably a more useful measure of impact, we have designed this work plan to yield data consistent with the benchmark that is being developed (i.e., a concentration-based benchmark). Stormwater flows through the lift station prior to discharge to Slip 4. Any entrained storm drain solids that may pass through the lift station to Slip 4 are likely to be a well-mixed composite from all of the NBF drainage areas.

<u>Section 9.0 (Schedule and Deliverables)</u>

- This first paragraph indicates that the results of the HHRA will be required for decision-making processes this fall. However, the third paragraph indicates that a draft HHRA report will be submitted by the end of December 2010. Please resolve this discrepancy.

  Response: The inconsistency in the text is being resolved.

Figure 2 – Conceptual Site Model

- The title of this figure should be clarified to indicate that this conceptual site model has a very narrow focus (specifically, it is a conceptual site model for risks to flightline workers from PCBs in JCM *[sic]*).

  Response: The title will be revised to clarify the narrow focus of the conceptual site model.

- Dust particles are listed as a secondary source. These presumably are airborne and then settle out on the concrete ground surface. However, these dust particles would settle out on buildings, equipment, and airplanes as well. How is contact with other surfaces addressed? This should be discussed in Section 2.

  Response: Section 2 will include a discussion of the rationale for evaluating the more conservative accumulation of PCBs in CJM fragments on the ground surface rather than other onsite surfaces.

- Larger particles of the caulk material have been observed in storm drain structures. How is direct contact with these larger particles addressed in this risk assessment? This should be discussed in Section 2.

  Response: Direct contact with larger particles of CJM will not be addressed separately from the evaluation described in this work plan. If the presence of those particles on paved surfaces is representative of normal conditions, they will be captured by surface wipe sampling. The presence of any larger CJM particles in solids that may enter the storm drain system will be captured in the sampling event characterizing concentrations of PCBs in storm drain solids in the focus area.

- According to Figure 2, dust particles are deposited on the ground surface and may be transported to indoor air via "wind entrainment." Wouldn't it also be likely that particles are tracked into indoor areas by workers (on shoes, for example)?

  Response: Indoor air and indoor areas are two separate issues. You are correct that the "surface deposition" to ground surface can be tracked into sheds on the shoes of maintenance workers as they walk into sheds; that is the basis for collecting samples from shed floors and not only indoor air. We will add a line to Figure 2 to make that transport mechanism clear.

- The conceptual site model shows that leaching and infiltration of PCBs from concrete joint material to subsurface soil may occur. Please define "subsurface soil" in this context. Is any soil below the concrete considered subsurface? PCB contamination of soil is likely to occur in the top several inches of soil located underneath the concrete.

  Response: A footnote will be added to define that subsurface soil is considered to be any soil below the concrete for the purposes of this evaluation. Regardless of the potential

for PCB contamination of subsurface soil, there are no complete, significant pathways for exposure to that soil in this evaluation.